

Ultrasound Elastography. A Possible Improvement into the Paraphernalia of Pancreatic Imaging

Generoso Uomo

Department of Internal Medicine, Cardarelli Hospital. Naples, Italy

Traditional imaging studies for evaluating pancreatic disease including abdominal ultrasound (US) and computerized tomography (CT) are widely utilized due to their availability, non-invasiveness, and familiarity on the part of physicians. Recently, the addition of endoscopic ultrasound (EUS), magnetic resonance imaging (MRI) and magnetic resonance cholangiopancreatography (MRCP) has significantly contributed to the ability of evaluating the pancreatic ductal and parenchymal anatomy and staging the malignancy using tissue samples. At the same time, the role of endoscopic retrograde cholangiopancreatography (ERCP) has diminished with the use of these less invasive modalities. Limitations in these conventional techniques include a lack of sensitivity and specificity in diagnosing early chronic pancreatitis, difficulties in differentiating malignancy from chronic or focal pancreatitis, and accuracy of staging pancreatic malignancy, particularly with regard to vascular involvement. Several recent advances in traditional imaging techniques have been described, which may improve the capability of accurately diagnosing and staging pancreatic disease, i.e., multidetector CT, micro-bubble contrast-enhanced ultrasound, secretin-stimulated MRCP, optical coherence tomography, diffusion-weighted MRI and MR spectroscopy [1]. Very recently a novel method of pancreatic imaging has been introduced, namely the US/EUS

elastography. Initial clinical applications have shown that US elastography might be able to distinguish tissues due to their specific consistency regarding differences of hardness and strain allowing diseased tissue to be distinguished from normal tissue. To tell the truth, elasticity imaging is nothing but an extension of the echopalpation of the earlier US methods for viewing tissue rigidity. Elasticity images consist of either an image of strain in response to force or an image of estimated elastic modulus. There are three main types of US elasticity imaging: elastography which tracks tissue movement during compression to obtain an estimate of strain, sonoelastography which uses color-Doppler to generate an image of tissue movement in response to external vibrations and tracking of shear wave propagation through tissue to obtain the elastic modulus [2]. Elasticity imaging is possible in almost all tissues. Breast mass elastography has potential for enhancing the specificity of US and mammography for cancer detection. Lesions in the thyroid, prostate gland and lymph nodes have been successfully imaged using elastography. Elasticity imaging may also be important in assessing the progress of ablation therapy, liver transplant rejection and cirrhosis. Vascular imaging including myocardium, blood vessel wall, plaque, lymphatic vessels and venous thrombi has also shown great potential. EUS elastography might also enhance the detection and differentiation of various solid tumors

(adrenal tumors, submucosal tumors, etc.) situated near the gastrointestinal tract.

Recently, the question as to whether the mapping of the tissue elasticity distribution might be useful for the differential diagnosis of focal pancreatic masses has been investigated [3]. The authors performed an interesting study in the setting of chronic pancreatitis where the accuracy of EUS-guided fine needle aspiration is notoriously unsatisfactory. The study group included a total of 68 patients distributed as follows: normal pancreas (n=22), chronic pancreatitis (n=11), pancreatic adenocarcinoma (n=32) and pancreatic neuroendocrine tumors (n=3). A subgroup analysis of 43 cases with focal pancreatic masses was also carried out. One important limitation of the study was the lack of surgical specimens in all cases. A post-processing software analysis was used to examine the EUS elastography images by calculating hue histograms of each individual image; the data obtained were then subjected to an extended neural network analysis to differentiate benign from malignant patterns. Based on a cutoff of 175 for the mean hue histogram values recorded on the region of interest, the sensitivity, specificity and accuracy of differentiation of benign and malignant masses were 91.4%, 87.9%, and 89.7%, respectively. The positive and negative predictive values were 88.9% and 90.6%, respectively. Utilization of this original methodology based on the artificial neural network processing of EUS elastography digital images, permitted an optimal prediction of the types of pancreatic lesions. The authors concluded that EUS elastography represents a promising method which allows characterization and differentiation of a normal pancreas, chronic pancreatitis, and pancreatic cancer. The use of US/EUS elastography thus seems to offer supplemental information which enhances conventional US/EUS imaging, with a possible decrease in the number of unnecessary fine-needle aspiration procedures

used for tissue confirmation [4]. However, future improvements in ultrasound elastography technology, as well as prospective, randomized studies, will probably establish the impact of dynamic elasticity imaging in clinical pancreatology, especially for the differential diagnosis of focal pancreatic masses.

Keywords Chronic Pancreatitis; Diagnosis, Differential; Elasticity Imaging Techniques; Pancreatic Neoplasms; Ultrasonography

Conflict of interest The author has no potential conflicts of interest

Correspondence

Generoso Uomo
Department of Internal Medicine
Cardarelli Hospital
Via Cardarelli, 9
80131 Napoli
Italy
Phone: +39-081.747.2101
Fax: +39-081.747.2117
E-mail: generoso.uomo@ospedalecardarelli.it

Document URL: <http://www.joplink.net/prev/200809/news.html>

References

1. Kinney TP, Freeman ML. Recent advances and novel methods in pancreatic imaging. *Minerva Gastroenterol Dietol* 2008; 54:85-95. [PMID 18299671]
2. Garra BS. Imaging and estimation of tissue elasticity by ultrasound. *Ultrasound Q* 2007; 23:255-68. [PMID 18090836]
3. Saftoiu A, Vilmann P, Gorunescu F, Ionut Gheonea D, Gorunescu M, Ciurea T, et al. Neural network analysis of dynamic sequences of EUS elastography used for the differential diagnosis of chronic pancreatitis and pancreatic cancer. *Gastrointest Endosc* 2008 Jul 23. [PMID 18656186]
4. Janssen J, Schlörer E, Greiner L. EUS elastography of the pancreas: feasibility and pattern description of the normal pancreas, chronic pancreatitis, and focal pancreatic lesions. *Gastrointest Endosc* 2007; 65:971-8. [PMID 17531630]